

What is claimed is:

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A 5 1. A polishing composition comprising a dispersion of particles, the particles comprising metal compounds and having an average particle diameter from about 5 nm to about 200 nm and a distribution of diameters such that at least about 95 percent of the particles have a diameter greater than about 60 percent of the average diameter and less than about 140 percent of the average diameter.

10 2. The polishing composition of claim 1 wherein the particles are dispersed in an aqueous solution.

3. The polishing composition of claim 1 wherein the particles are dispersed in a nonaqueous solution.

15 4. The polishing composition of claim 1 wherein the particles comprise a composition selected from the group consisting of SiO₂, SiC, TiO₂, Fe₃C, Fe₇C₃, Fe₂O₃, Fe₃O₄, MoS₂, MoO₂, WC, WO₃, and WS₂.

20 5. The polishing composition of claim 1 wherein the particles have an average diameter from about 5 nm to about 100 nm.

20 6. A method of smoothing a surface comprising the step of polishing the surface with the polishing composition of claim 1.

25 7. The method of claim 6 wherein the polishing is performed with a polishing pad.

25 8. The method of claim 6 wherein the polishing is performed with a motorized polisher.

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A 30 9. A polishing composition comprising a dispersion of particles, the particles comprising metal compounds with an average particle diameter from about 5 nm to about 200 nm and a single crystalline phase with a uniformity of at least about 90 percent by weight.

10. The polishing composition of claim 9 wherein the particles comprise a composition selected from the group

consisting of SiO_2 , SiC , TiO_2 , Fe_3C , Fe_7C_3 , Fe_2O_3 , Fe_3O_4 , MoS_2 , MoO_2 , WC , WO_3 and WS_2 .

11. The polishing composition of claim 9 wherein the particles have an average diameter from about 5 nm to about 100 nm.

12. The polishing composition of claim 9 wherein the particles have a single crystalline phase with a uniformity of at least about 95 percent by weight.

13. The polishing composition of claim 9 wherein the particles have a single crystalline phase with a purity of at least about 99 percent by weight.

14. The polishing composition of claim 9 wherein the particles have a single crystalline phase with a purity of at least about 99.9 percent by weight.

15. A polishing composition comprising a dispersion of particles, the particles comprising metal compounds or silicon compounds with an average particle diameter from about 5 nm to about 200 nm and effectively no particles with a diameter greater than 1 micron.

16. A polishing composition comprising a dispersion of particles, the particles comprising metal carbides or metal sulfides and having an average particle diameter from about 5 nm to about 200 nm.

17. A method of producing SiO_2 particles comprising the step of pyrolyzing a molecular stream comprising a silicon compound precursor, an oxidizing agent and a radiation absorbing gas in a reaction chamber, where the pyrolysis is driven by heat absorbed from a laser beam.

18. The method of claim 17 wherein the silicon compound precursor comprises a compound that is selected from the group consisting of CH_3SiCl_3 .

19. The method of claim 17 wherein the laser beam is supplied by a CO_2 laser.

.20. The method of claim 17 wherein the molecular stream is generated by a nozzle elongated in one dimension.

21. A method of producing iron oxide particles comprising the step of pyrolyzing a molecular stream
5 comprising a iron compound precursor, an oxidizing agent and a radiation absorbing gas in a reaction chamber, where the pyrolysis is driven by heat absorbed from a laser beam.

22. The method of claim 21 wherein the iron precursor comprises $\text{Fe}(\text{CO})_5$.

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